

Cancelled Repl. by 37A

Federal Aviation Agency

ADVISORY CIRCULAR



AC NO: AC 20-37

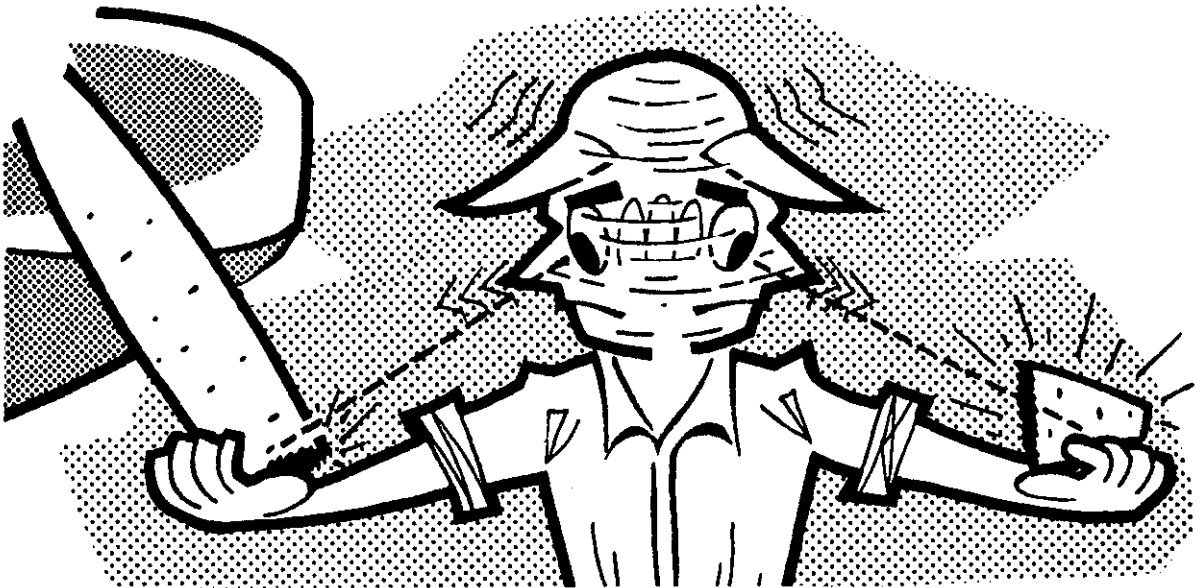
AIRCRAFT

EFFECTIVE :

6/7/65

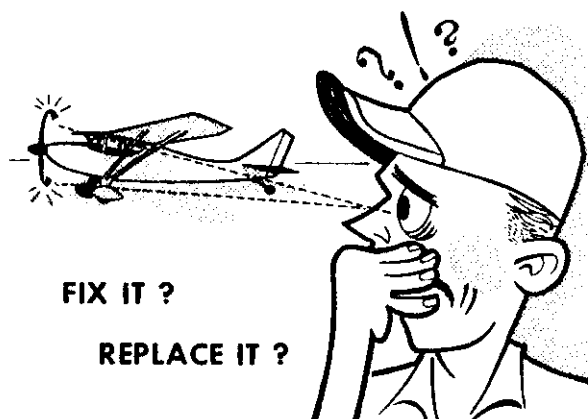
SUBJECT : AIRCRAFT METAL PROPELLER BLADE FAILURE

1. PURPOSE. This advisory circular provides information and suggested procedures to increase service life and to minimize blade failures of metal propellers.
2. CANCELLATION. Bureau of Flight Standards Release No. 440, Metal Propeller Blade Failure on General Aircraft, is canceled.
3. GENERAL. A high margin of safety is incorporated in the design of modern metal propeller blades. Even so, failures occur. The increasing number of reported failures is not peculiar to any one airframe/engine/propeller combination.

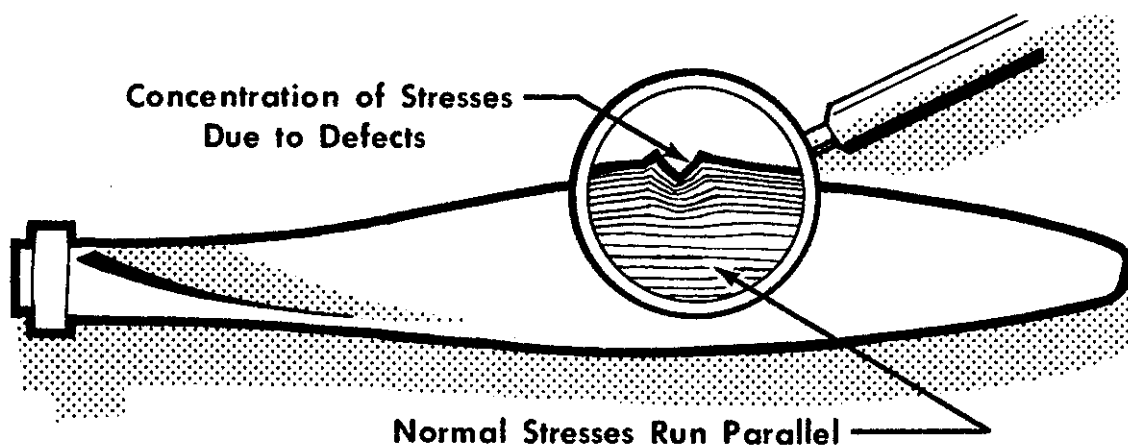


6/7/65

4. WHY BLADES FAIL. An investigation of a representative number of propeller blades disclosed that failures occurred because of fatigue cracks which started at mechanically formed dents. Blade material samples analyzed did not reveal evidence of failure caused by material defects or surface discontinuities existing before the blades were placed in service.

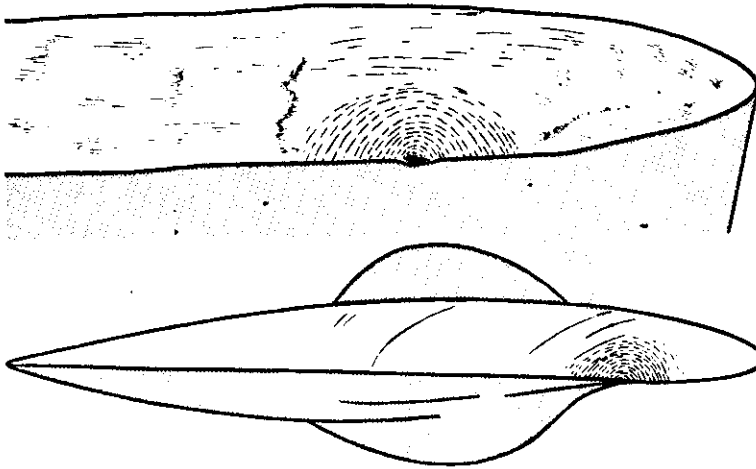


Often fatigue failure occurs at a place where previous damage had been repaired. This may be due to the failure actually having started prior to the repair or the repair may have been improperly performed. Too many blade straightening or blade repitching operations can overstress the metal, causing it to fail. The Federal Aviation Agency and the propeller blade manufacturers stipulate how much a blade may be deformed and still be straightened. Any repairs beyond these limits may lead to propeller failure.



5. HOW BLADES FAIL. When normal forces act on a propeller blade, they cause stresses which generally run parallel with each other throughout most of the outer length of the blade.

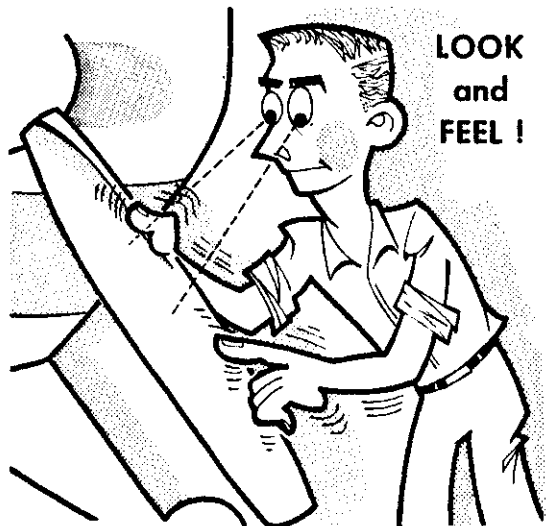
When a defect occurs in a propeller blade a number of the parallel lines of stress tend to concentrate at one point at the defect. Even a small defect, such as a nick or dent, may develop into a crack. This crack causes a greater stress concentration than existed before - the crack spreads out - and finally the entire blade may fail. This condition is so common, and the results are so serious, that great emphasis is placed on the daily and preflight inspections of propeller blades for defects. Whenever they are found, the defect should be remedied or the propeller should be replaced immediately.



6. WHERE BLADES FAIL. Service experience indicates fatigue failures usually occur within a few inches of the blade tip. Failures also occur in the blade near the shank and at the propeller hub well out of the critical areas; therefore, NO DAMAGE SHOULD BE OVERLOOKED OR ALLOWED TO GO WITHOUT CORRECTION!

7. BLADE INSPECTION. When performing an inspection on the propeller, especially during the preflight inspection, inspect blades completely - not just the leading edge - for erosion, scratches, nicks, and cracks. Regardless of how small the surface irregularity, consider it as a stress riser subject to fatigue failure.

Propeller manufacturers' manuals, service letters, and bulletins specify methods and limits for blade maintenance, inspection, service, and repair. Similar information is also available from the Federal Aviation Agency. All propeller repairs should be performed by qualified personnel.



8. **"BLADE TIPS."** Your conscientious application of these helpful tips will greatly reduce potential and actual propeller blade failures:
- Keep blades clean - the crack cannot be seen if covered with scum or other foreign matter.
 - Avoid engine runup areas containing loose rocks, gravel, etc.
 - Do not move the aircraft by pushing or pulling on the propeller blades - they were not designed to be used as handles.



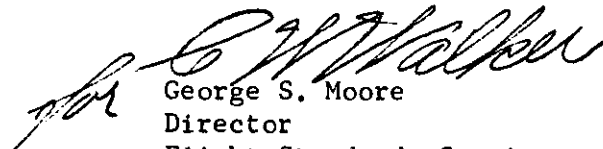
9. **HELP WANTED.** In order to continuously develop improved design data, operational procedures, and maintenance techniques, we should have information relative to all propeller blade failures. We request that owners, pilots, and maintenance personnel cooperate by voluntarily reporting all propeller blade failures. FAA Form 1226, Malfunction or Defect Report, is a convenient means of supplying FAA with the desired information. It may be obtained from any FAA General Aviation District Office (FAA Advisory Circular AC No. 20-23, Interchange of Service Experience - Mechanical Difficulties, provides complete instruction for use of FAA Form 1226). Information that would be of great value to us in these investigations include:

6/7/65

- a. A brief maintenance and operation history of the airframe and engine, including any incident of sudden engine stoppage due to the propeller contacting the ground or other objects.
- b. Complete history of propeller, including any previous damage, all repairs and alterations, operating time in service since any repairs or alterations have been performed, total operating time, and whether or not the propeller has been used on other aircraft.
- c. Information relative to any instance of rough engine operation at any time during the life of the installation.
- d. On engines which incorporate dynamic dampers on the crankshaft, the wear that has accumulated in the damper and attaching parts may be significant.

Fortunately, in most cases of propeller failure, a safe landing is accomplished with little or no other damage. In many cases the propeller manufacturer may wish to install a new propeller on the aircraft on which a blade has failed and conduct tests before any repairs or adjustments are accomplished. Your cooperation with the manufacturers in this respect should prove beneficial to all.

We solicit the cooperation of the aviation community in the investigation of propeller fatigue failures. Our combined efforts and contributions in this regard can materially enhance flying safety.


George S. Moore
Director
Flight Standards Service